

WHAT IS CLAIMED IS:

1. A pattern forming method comprising the steps of:

a) forming a resist film out of a resist material on a substrate;

b) pre-baking the resist film;

c) exposing the pre-baked resist film to extreme ultraviolet radiation through a photomask; and

d) developing the exposed resist film, thereby defining a resist pattern on the substrate,

wherein the steps b) and c) are carried out in a vacuum without subjecting the resist film to the air.

2. The method of Claim 1, wherein the step b) comprises heating the resist film while irradiating the resist film with a type of radiation having too long a wavelength to sensitize the resist film.

3. A pattern forming method comprising the steps of:

a) forming a resist film out of a resist material on a substrate in a first processing chamber filled with the air or an inert gas;

b) pre-baking the resist film in a second processing chamber filled with a vacuum;

c) transporting the pre-baked resist film in line to a third processing chamber filled with a vacuum and then expos-

ing the pre-baked resist film to extreme ultraviolet radiation through a photomask in the third processing chamber; and

d) transporting the exposed resist film in line to the first processing chamber and then developing the exposed resist film in the first processing chamber, thereby defining a resist pattern on the substrate.

4. The method of Claim 3, wherein the step b) comprises heating the resist film while irradiating the resist film with a type of radiation having too long a wavelength to sensitize the resist film.

5. A pattern forming method comprising the steps of:

a) forming a resist film out of a chemically amplified resist material on a substrate;

b) pre-baking the resist film;

c) exposing the pre-baked resist film to extreme ultraviolet radiation through a photomask;

d) post-baking the exposed resist film; and

e) developing the post-baked resist film, thereby defining a resist pattern on the substrate,

wherein the steps b), c) and d) are carried out in a vacuum without subjecting the resist film to the air.

6. The method of Claim 5, wherein the step b) comprises

heating the resist film while irradiating the resist film with a type of radiation having too long a wavelength to sensitize the resist film.

7. A pattern forming method comprising the steps of:

a) forming a resist film out of a chemically amplified resist material on a substrate in a first processing chamber filled with the air or an inert gas;

b) pre-baking the resist film in a second processing chamber filled with a vacuum;

c) transporting the pre-baked resist film in line to a third processing chamber filled with a vacuum and then exposing the pre-baked resist film to extreme ultraviolet radiation through a photomask in the third processing chamber;

d) transporting the exposed resist film in line to the second processing chamber and then post-baking the exposed resist film in the second processing chamber; and

e) transporting the post-baked resist film in line to the first processing chamber and then developing the post-baked resist film in the first processing chamber, thereby defining a resist pattern on the substrate.

8. The method of Claim 7, wherein the step b) comprises heating the resist film while irradiating the resist film with a type of radiation having too long a wavelength to sensitize

the resist film.

9. A pattern forming method comprising the steps of:

a) forming a resist film out of a chemically amplified resist material on a substrate;

b) pre-baking the resist film;

c) exposing the pre-baked resist film to extreme ultraviolet radiation through a photomask;

d) post-baking the exposed resist film;

e) forming a silylated layer selectively on the surface of the post-baked resist film; and

f) dry-developing the resist film, on which the silylated layer has been formed, using the silylated layer as a hard mask, thereby defining a resist pattern on the substrate,

wherein the steps b), c), d), e) and f) are carried out in a vacuum without subjecting the resist film to the air.

10. The method of Claim 9, wherein the step b) comprises heating the resist film while irradiating the resist film with a type of radiation having too long a wavelength to sensitize the resist film.

11. A pattern forming method comprising the steps of:

a) forming a resist film out of a photoresist material on a substrate in a first processing chamber filled with the

air or an inert gas;

b) pre-baking the resist film in a second processing chamber filled with a vacuum;

c) transporting the pre-baked resist film in line to a third processing chamber filled with a vacuum and then exposing the pre-baked resist film to extreme ultraviolet radiation through a photomask in the third processing chamber;

d) transporting the exposed resist film in line to the second processing chamber and then post-baking the exposed resist film in the second processing chamber;

e) transporting the post-baked resist film in line to a fourth processing chamber filled with a vacuum and then forming a silylated layer selectively on the surface of the post-baked resist film in the fourth processing chamber; and

f) transporting the resist film, on which the silylated layer has been formed, in line to a fifth processing chamber filled with a vacuum and then dry-developing the resist film, having the silylated layer thereon, using the silylated layer as a hard mask in the fifth processing chamber, thereby defining a resist pattern on the substrate.

12. The method of Claim 11, wherein the step b) comprises heating the resist film while irradiating the resist film with a type of radiation having too long a wavelength to sensitize the resist film.

13. An apparatus for fabricating a semiconductor device, comprising:

a first processing chamber for forming a resist film out of a resist material on a substrate and for defining a resist pattern on the substrate by developing the resist film that has been exposed to extreme ultraviolet radiation;

a second processing chamber, filled with a vacuum, for pre-baking the resist film; and

a third processing chamber, also filled with a vacuum, for exposing the pre-baked resist film to the extreme ultraviolet radiation through a photomask.

14. The apparatus of Claim 13, wherein the second processing chamber comprises means for irradiating the resist film with a type of radiation having too long a wavelength to sensitize the resist film.

15. The apparatus of Claim 13, wherein the second processing chamber comprises means for exhausting a gas, emanated from the resist film, out of the second processing chamber.

16. An apparatus for fabricating a semiconductor device, comprising:

a first processing chamber for forming a resist film out of a chemically amplified resist material on a substrate and

for defining a resist pattern on the substrate by developing the resist film that has been exposed to extreme ultraviolet radiation;

a second processing chamber, filled with a vacuum, for pre- and post-baking the resist film before and after the resist film is exposed to the extreme ultraviolet radiation, respectively; and

a third processing chamber, also filled with a vacuum, for exposing the pre-baked resist film to the extreme ultraviolet radiation through a photomask.

17. The apparatus of Claim 16, wherein the second processing chamber comprises means for irradiating the resist film with a type of radiation having too long a wavelength to sensitize the resist film.

18. The apparatus of Claim 16, wherein the second processing chamber comprises means for exhausting a gas, emanated from the resist film, out of the second processing chamber.

19. An apparatus for fabricating a semiconductor device, comprising:

a first processing chamber for forming a resist film out of a chemically amplified resist material on a substrate;

a second processing chamber, filled with a vacuum, for

pre- and post-baking the resist film before and after the resist film is exposed to extreme ultraviolet radiation, respectively;

a third processing chamber, also filled with a vacuum, for exposing the pre-baked resist film to the extreme ultraviolet radiation through a photomask;

a fourth processing chamber for forming a silylated layer selectively on the surface of the post-baked resist film; and

a fifth processing chamber for defining a resist pattern on the substrate by dry-developing the resist film, on which the silylated layer has been formed, using the silylated layer as a hard mask.

20. The apparatus of Claim 19, wherein the second processing chamber comprises means for irradiating the resist film with a type of radiation having too long a wavelength to sensitize the resist film.

21. The apparatus of Claim 19, wherein the second processing chamber comprises means for exhausting a gas, emanated from the resist film, out of the second processing chamber.